

Characteristic table & excitation table for SR flip flop

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Truth Table :-

Clock	S	R	$Q_{n+1}$
0	x	x	$Q_n \rightarrow$ P.S.C
1	0	0	$Q_n$ (Memory)
1	0	1	0
1	1	0	1
1	1	1	Invalid

Characteristic Table :-

$\text{Clock} = 1$

$Q_n$	S	R	$Q_{n+1}$
0	0	0	0
0	0	1	0
0	1	0	1
0	1	1	x
1	0	0	1
1	0	1	0
1	1	0	1
1	1	1	x

P.S.C = P.S.

Excitation table :-

$Q_n$	$Q_{n+1}$	S	R
0	0	0	x
0	1	1	0
1	0	0	1
1	1	x	0

Play (k)

3-Bit Synchronous Up Counter

Step:-1 Determine no. of ffs  
Decide type of ff

no. of ff = 3

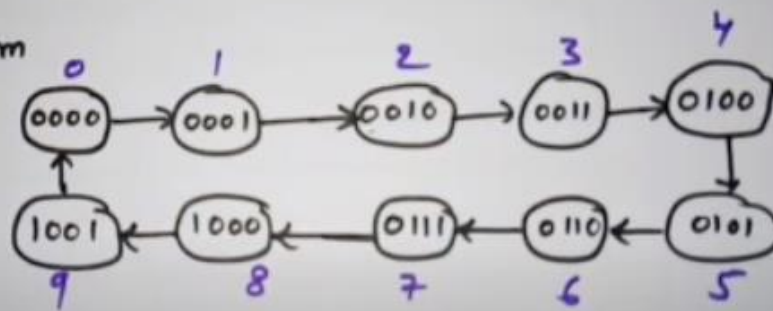
T flip flop

Step:-2

P.S. $Q_n$	N.S. $Q_{n+1}$	T
0	0	0
0	1	1
1	0	1
1	1	0

Play (k)

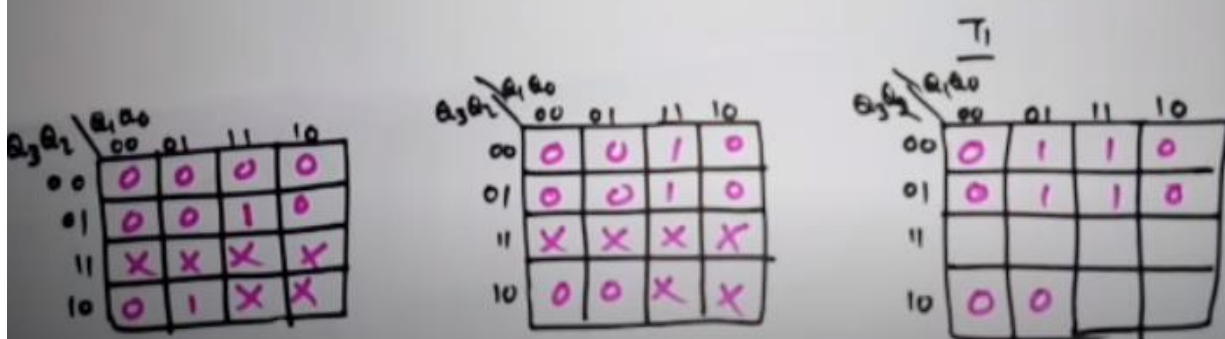
state diagram



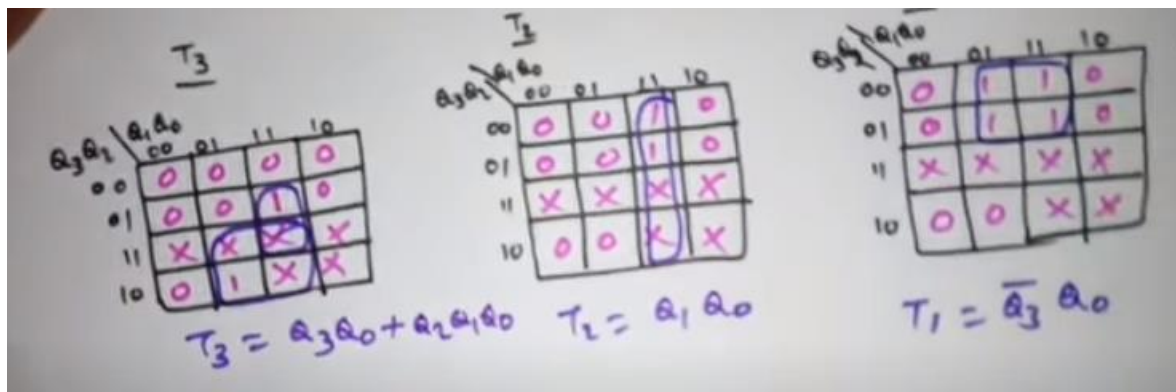
Decade counter  
(or) BCD counter

CLK	P.S $Q_3 Q_2 Q_1 Q_0$	N.S $Q_3 Q_2 Q_1 Q_0$	Required Excitations			
			$T_3$	$T_2$	$T_1$	$T_0$
1	0000	0001	0	0	0	1
2	0001	0010	0	0	1	1
3	0010	0011	0	0	0	1
4	0011	0100	0	1	1	1
5	0100	0101	0	0	0	1
6	0101	0110	0	0	1	1
7	0110	0111	0	0	0	1
8	0111	1000	1	1	1	1
9	1000	1001	0	0	0	1
10	1001	0000	1	0	0	1

Play (k)



Play (k)



choice of FF & excitation table

CLK	P.S $Q_2 Q_1 Q_0$			N.S $Q_2 Q_1 Q_0$			Required excitations					
	$Q_2$	$Q_1$	$Q_0$	$Q_2$	$Q_1$	$Q_0$	$T_2$	$K_2$	$T_1$	$K_1$	$T_0$	$K_0$
1	0	0	0	1	1	1						
2	1	1	1	1	1	0						
3	1	1	0	1	0	1						
4	1	0	1	1	0	0						
5	1	0	0	0	1	1						
6	0	1	1	0	0	0						

$Q_n$	$Q_{n+1}$	J	K
0	0	0	X
0	1	1	X
1	0	X	1
1	1	X	0

CLK	P.S			N.S			Required excitations					
	$Q_2$	$Q_1$	$Q_0$	$Q_2$	$Q_1$	$Q_0$	$T_2$	$K_2$	$T_1$	$K_1$	$T_0$	$K_0$
1	0	0	0	1	1	1	1	x	1	x	1	x
2	1	1	1	1	1	0	x	0	x	0	x	1
3	1	1	0	1	0	1	x	0	x	1	1	x
4	1	0	1	1	0	0	x	0	0	x	x	1
5	1	0	0	0	1	1	x	1	1	x	1	x
6	0	1	1	0	0	0	0	x	x	1	x	1

Lecture No: -129

### Characteristic and Excitation table for JK ff

Ch. Table :- P.I

K	J	$Q_{n+1}$
x	x	$Q_n$
0	0	$Q_n$
0	1	0
1	0	1
1	1	$\overline{Q_n}$ (toggle)

0101...

Ch. Table :-

$Q_n$	J	K	$Q_{n+1}$
0	0	0	0
0	0	1	0
0	1	0	1
0	1	1	1
1	0	0	1
1	0	1	0
1	1	0	1
1	1	1	0

Excitation table :-

$Q_n$	$Q_{n+1}$	J	K
0	0	0	x
0	1	1	x
1	0	x	1
1	1	x	0

for J

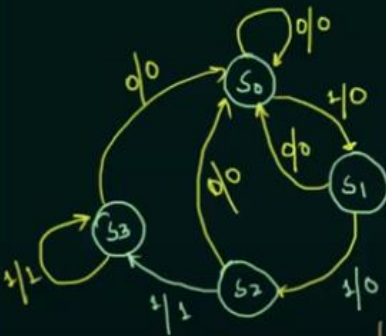
$J = Q_n$

$K = \overline{Q_{n+1}}$

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## Pattern or Sequence Detector (Example)

Design a sequence detector to detect three or more consecutive 1's in a string of bits coming through an input line.



$$\begin{cases} S_0 = 00 & S_2 = 10 \\ S_1 = 01 & S_3 = 11 \end{cases}$$

Play (k) : Assignment : -

$x = 00111011100\dots$

$y = 00001000110\dots$  (0V)

$y = 00001000100\dots$  (non ov)

	Has	Avoids
$S_0 = \text{reset}$	---	LLL...
$S_1 = 1$	L	LL...
$S_2 = 11$	1L	L....
$S_3 = 111$	111	.....

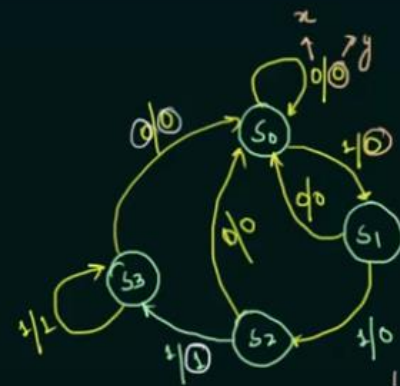
11111

7:32 / 15:38

$Q_A$	$Q_B$	$x$	$Q_A^+$	$Q_B^+$	$y$
0	0	0	0	0	0
0	0	1	0	1	0
0	1	0	0	0	0
0	1	1	1	0	0
1	0	0	0	0	0
1	0	1	1	1	1
1	1	0	0	0	0
1	1	1	1	1	1

$NS = D$

$D_A = Q_A^+$   
 $D_B = Q_B^+$





1	0	1	1	1	1
1	1	0	0	0	0
1	1	1	1	1	1

$$Q_B^+ = D_B$$

	$Q_B \backslash Q_A$	00	01	11	10
0	0	0	0	1	0
1	0	1	1	1	0

$$Q_A^+ = D_A = Q_B x + Q_A x = (Q_A + Q_B) \cdot x$$

	$Q_B \backslash Q_A$	00	01	11	10
0	0	0	1	0	0
1	0	0	1	1	0

$$Q_B^+ = D_B = (\bar{Q}_B + Q_A) \cdot x$$

for y :-

	$Q_B \backslash Q_A$	00	01	11	10
0	0	0	0	0	0
1	0	0	1	1	0

$$y = Q_A x$$



$$y = Q_A$$

